6450-01-P

Spent Nuclear Fuel Management at the Savannah River Site

AGENCY: U.S. Department of Energy.

ACTION: Amended Record of Decision.

SUMMARY: The U.S. Department of Energy (DOE) is amending its August 7, 2000, Record of Decision (ROD) pursuant to the *Savannah River Site Spent Nuclear Fuel Management Final Environmental Impact Statement, Aiken, SC* (DOE/EIS-0279, 2000; SRS SNF EIS). In the 2000 ROD, DOE decided to develop and demonstrate the "melt and dilute" technology to manage approximately 28.6 metric tons of heavy metal (MTHM) of aluminum-clad SNF, consistent with its preferred alternative identified in the SRS SNF EIS.

DOE now amends that decision and will manage approximately 3.3 MTHM from the currently projected inventory of 22 MTHM at SRS using conventional processing[1] at the H-Canyon facility at SRS, as described and evaluated under the Conventional Processing Alternative in the SRS SNF EIS. The quantity of 3.3 MTHM is the minimum amount of SNF necessary to avoid the need for costly modifications to the L-Basin that would allow DOE to accommodate expected receipts of SNF for the foreseeable future. This includes up to 200 High Flux Isotope Reactor (HFIR) cores generated at the Oak Ridge National Laboratory and approximately 1,000 bundles of aluminum-clad SNF currently stored at SRS, as well as target residue materials[2]

[1] Conventional processing is a chemical separations process that involves dissolving spent fuel in nitric acid and separating fission products from uranium using solvent extraction.

[2] Target materials are residual materials left after the desired isotopes have been removed from the targets. For example, target materials could be residual materials from the production in a research reactor of molybdenum-99,

containing enriched uranium (including target materials from Canada that contain liquid Highly Enriched Uranium (HEU) of U.S. origin). DOE anticipates that processing this SNF and target residue material would begin as early as 2014 and continue approximately four years. As a result of this amended decision, HEU in the SNF and target materials will be down-blended to low-enriched uranium (LEU). This end product will not be useable in nuclear weapons, but will be available for use in commercial power reactors such as those operated by the Tennessee Valley Authority (TVA) to generate electricity. DOE will continue to safely store the aluminum-clad SNF not addressed in this Amended ROD in L-Basin at SRS, pending future analysis and DOE decisions.

In accordance with DOE regulations for implementing the National Environmental Policy Act (NEPA), DOE has prepared a Supplement Analysis (SA) to examine previous NEPA analyses of the management of SNF at SRS, particularly the SRS SNF EIS and the *Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel Environmental Impact Statement* (DOE/EIS-0218, 1996, FRR EIS) tiered from the *Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Final Environmental Impact Statement* (DOE/EIS-0203, 1995), to determine whether DOE's amended decision would make substantial changes in its proposed actions or whether there are significant new circumstances or information relevant to environmental concerns and bearing on the proposed action or its potential impacts. Based on the SA, DOE has determined that a supplemental or new EIS is not required.

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which decays to technetium-99, a medical isotope. Targets may be shaped as plates, pins, or cylinders. Target materials are not high-level radioactive waste.

The actions to be taken pursuant to this Amended ROD strongly support U.S. non-proliferation policy and goals by permanently dispositioning HEU. In particular, this amended decision implements the U.S. and Canadian agreement reached at the Nuclear Security Summit in March 2012 to expand efforts to return U.S.-origin HEU currently stored in Canada to the U.S. The commitment supports international efforts to consolidate and dispose of HEU and to combat nuclear terrorism. The actions addressed in this amended decision will free existing storage space in L-Basin, avoiding the need and cost required to provide additional new space in the Basin. This in turn will allow for continued receipt of Foreign Research Reactor SNF (FRR SNF), adequate storage for HFIR cores, continued operation of HFIR in support of DOE's research and development mission, dispositioning of HEU out of South Carolina, and cost-effective use of DOE's H-Canyon processing facility at SRS.

ADDRESSES: This Amended ROD, the SA for SRS SNF Management, and related NEPA documents are available on the DOE NEPA Website at www.nepa.energy.gov and the SRS Website at www.srs.gov/general/pubs/envbul/nepa/htm. To request copies of these documents, please contact:

Mr. Andrew R. Grainger, NEPA Compliance Officer
Savannah River Operations Office
U.S. Department of Energy
P.O. Box B
Aiken, South Carolina 29802
Telephone: (803) 952-8001
Email: drew.grainger@srs.gov

FOR FURTHER INFORMATION CONTACT: For further information on the management of SNF at SRS, please contact Mr. Grainger as listed above.

For information on DOE's NEPA process, please contact:

Ms. Carol M. Borgstrom, Director
Office of NEPA Policy and Compliance, GC-54
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585
Telephone: (202) 586-4600, or leave a message at (800) 472-2756
Email: askNEPA@hq.doe.gov

SUPPLEMENTARY INFORMATION:

Background

DOE's purpose and need for action, as described in the SRS SNF EIS, is to develop and implement a safe and efficient SNF management strategy that includes preparing aluminum-clad SNF and target material stored at SRS, or expected to be shipped to SRS, for ultimate disposition offsite.

In the SRS SNF EIS, DOE grouped the SNF to be managed based on characteristics such as fuel size, physical and chemical properties, and radionuclide inventory. The fuel groups and the seven technologies that could be used to prepare the SNF for disposition are described in the SRS SNF EIS. The potential environmental impacts associated with the use of these technologies, including conventional processing, were analyzed in the SRS SNF EIS. In the ROD for the SRS SNF EIS (65 FR 48224; August 7, 2000), DOE identified the Minimum

Impact Alternative as the environmentally preferable alternative, but selected the Preferred Alternative.[3]

To implement the Preferred Alternative described in the SRS SNF EIS, DOE decided to use a combination of technologies, including melt and dilute, to manage the SNF. The melt and dilute technology was to be used to treat all Group B fuel (about 20 MTHM of Material Test Reactor fuel from foreign and domestic reactors), all Group C fuel (about 8 MTHM of oxide and silicide foreign and domestic reactor fuel) except failed fuel (which DOE would treat by conventional processing), and most Group D materials (about 0.6 MTHM of foreign research reactor targets). DOE estimated that these fuels and target materials would total approximately 28.6 MTHM, based on quantities then stored at SRS and estimated quantities located at domestic and foreign reactor locations scheduled or eligible to ship fuel to SRS.[4] These shipments began in 1996 and are continuing. DOE now estimates that there are approximately 22 MTHM of SNF and target material at or eligible to be sent to SRS. This is less than the 28.6 MTHM evaluated in the SRS SNF EIS because DOE now expects to receive less FRR SNF than originally estimated.

The FRR EIS evaluated alternatives for return to the United States of SNF and target materials containing HEU enriched in the United States and supplied to foreign countries. Return of HEU for safe storage and disposition advances the United States nuclear material nonproliferation goals. Appendix B1.5 of the FRR EIS discusses the two methods for preparing the target residue

[3] DOE developed five alternatives that could be used to manage SNF: No Action; Minimum Impact; Direct Disposal; Maximum Impact; and the Preferred Alternative; these alternatives and the fuel groups are described in the SRS SNF EIS and summarized in the 2000 ROD.

[4] On June 1, 1995, DOE announced that, among other actions, aluminum-clad SNF would be consolidated at SRS for management and non-aluminum-clad SNF would be consolidated at the Idaho National Laboratory (INL) (60 FR 28680; June 1, 1995). In keeping with this decision, when DOE announced its decision to implement a new foreign research reactor spent fuel acceptance policy, DOE stated that aluminum-clad fuel would be shipped to SRS and non-aluminum-clad fuel would be shipped to the INL (61 FR 25092; May 17, 1996).

materials for transport: calcining and oxidizing. In the FRR EIS, DOE assumed that target residue material would be transported in solid form, and DOE evaluated the impacts of transportation accordingly. In Appendix B.2.1.2 of the FRR EIS, DOE explained that foreign research reactor shipments would be carried out in accordance with regulations set by the Department of Transportation (49 CFR Parts 171 through 178) and the Nuclear Regulatory Commission (NRC) (10 CFR Part 71); those regulations remain in place. In the FRR ROD, DOE decided, consistent with the programmatic decision to consolidate storage by fuel type, to transport to and store aluminum-clad SNF and target material at the SRS.

Supplement Analysis

In accordance with DOE NEPA regulations at 10 CFR 1021.314, DOE prepared an SA for the SRS SNF EIS and the FRR EIS (DOE/EIS-0279-SA-01 and DOE/EIS-0218-SA-06, March 2013) to consider a proposal to process the minimum quantity of SNF necessary to avoid the need for costly modifications to the L-Basin that would allow DOE to accommodate expected receipts of SNF for the foreseeable future. To do this, DOE estimated that processing approximately 1000 bundles of SNF and up to 200 HFIR cores currently stored at SRS would provide the minimum necessary amount of storage space. This could be accomplished over approximately a four-year period and equates to approximately 3.3 MTHM of the currently projected 22 MTHM total inventory. DOE would continue to safely store the remaining SNF in L-Basin at SRS, pending future analysis and DOE decisions. DOE also evaluated plans to receive FRR target residue material from Canada in accordance with U.S. acceptance policy and

consistent with U.S. nonproliferation objectives. The target material, containing U.S.-origin HEU in liquid form, would be shipped in Type B casks certified by NRC.

The SA compared the proposal to the relevant NEPA reviews to determine whether the proposal would make substantial changes in the proposed actions identified in the SRS SNF EIS or FRR EIS, or whether there are significant new circumstances or information relevant to environmental concerns and bearing on the proposed action or its impacts, consistent with the Council on Environmental Quality NEPA implementing regulations at 40 CFR Parts 1502.9. DOE analyzed the use of conventional processing for SNF in lieu of the melt and dilute technology, which was never developed due to technical issues involving the off-gas system and funding limitations. The conventional processing approach is consistent with U.S. nuclear non-proliferation goals in that HEU would be eliminated and plutonium present in the SNF would not be separated from the fission products. Processing of the approximately 3.3 MTHM of SNF and target residue materials in H-Canyon will result in plutonium-bearing high-level waste (HLW) that will be vitrified in the Defense Waste Processing Facility (DWPF) at SRS, creating up to approximately 24 canisters of vitrified, proliferation-resistant HLW. This increase is not significant in the context of the approximately 7,000 canisters DOE estimates will be otherwise produced by the DWPF, and is within the DWPF production and SRS planned storage capabilities.

In the SA, DOE evaluated the addition of a third dissolver in H-Canyon to return the dissolving capacity for SNF to the level supported by H-Canyon's off-gas system and processing capability[5], which are the capacities evaluated in the SRS SNF EIS. Installation and operation of

[5] One H-Canyon dissolver currently supports dissolution of plutonium metal, preparatory to oxidizing it in the HB-Line to prepare plutonium oxide feed material for the Mixed Oxide Fuel Fabrication Facility (see Interim Action

a third dissolver in H-Canyon will take place entirely within H-Canyon and will not result in any land disturbance. Construction waste generated will be managed using existing SRS facilities and procedures. Operation of a third dissolver is within H-Canyon's dissolving capacity for SNF and is supported by existing systems, e.g., off-gas system. DOE would continue to use one existing dissolver to process plutonium material; plutonium dissolution does not require use of the off-gas treatment system or H-Canyon's solvent extraction capacity and raffinate systems. The air and liquid releases and other impacts of operating two dissolvers and the associated systems to process SNF would not significantly differ from those reported in the SRS SNF EIS, because the evaluation of the potential environmental impacts associated with conventional processing assumed the use of two dissolvers.

In the SA, DOE also evaluated the transportation, receipt, and processing of target residue materials in liquid form (from Canada) rather than solid form and found that the potential environmental impacts would not significantly differ from results presented in the FRR EIS and the SRS SNF EIS. For this analysis, DOE assumed that the NRC would certify use of an existing Type-B cask for the target residue materials. NRC consideration of the certification request is ongoing. Based on conclusions reached in the SA, DOE determined that the preparation of a supplemental or new EIS is not required.

Amended Decision

Determination, Use of H-Canyon/HB-Line to Prepare Feed for Mixed Oxide Fuel Fabrication Facility at the Savannah River Site, June 2012).

DOE has decided to manage up to 200 HFIR cores, approximately 1,000 bundles of SNF, and target residue materials containing HEU (including target residue materials containing liquid HEU from Canada) using conventional processing in H-Canyon at SRS. This SNF and these target residue materials, totaling approximately 3.3 MTHM, include material from Groups B, C, and D identified in the SRS SNF EIS. HEU recovered during conventional processing will be down-blended to create LEU feedstock for fuel fabrication for commercial nuclear reactors. The shipments of target residue materials in liquid form from Canada will comply with all applicable transportation regulations in both countries to ensure environmental protection and the safety of the involved workers and the general public. No target material or waste from processing target material will be returned to Canada. DOE will implement minor modifications to H-Canyon to receive liquid HEU as described in the SA.

DOE anticipates processing these materials beginning as early as 2014 and continuing approximately four years, consistent with program and policy priorities. DOE will install a third dissolver in H-Canyon in addition to two existing dissolvers, in order to cost-effectively utilize H-Canyon, and expeditiously complete the mission.

The aluminum-clad SNF not addressed in this amended ROD will remain safely in wet storage in L-Basin at SRS, pending future analysis and DOE decisions. The water chemistry will continue to be rigorously controlled to prevent any corrosion reactions between the storage tubes, fuel, and the basin water.

No environmental impacts resulting from operations under this amended decision would require specific mitigation measures. DOE will continue its current practices and policies to use all practicable means to avoid or minimize environmental harm and impacts to workers when implementing the actions described herein. For example, DOE will continue to evaluate and implement, as appropriate, physical modifications to the H-Canyon facility and process chemistry changes that would reduce personnel exposure, facility effluents, and waste generation.

Basis for Decision

This amended decision reduces the overall cost of managing the currently stored fuel by eliminating the need for additional SNF storage racks in the L-Basin SNF storage facility and allows for future receipt of foreign and domestic SNF, including continued receipt of HFIR cores from the Oak Ridge National Laboratory in support of DOE's research and development mission. In addition, this amended decision will maximize near-term utilization of H-Canyon and expeditiously complete the mission

This amended decision supports DOE's ongoing approach for reducing the proliferation risks inherent in stocks of HEU by down-blending surplus HEU to LEU. The LEU would be available for use in commercial reactors such as those operated by TVA. In addition, operation of H-Canyon to process the SNF is consistent with section 3137 of the Floyd D. Spence Defense Authorization Act for fiscal year (FY) 2001 (Public Law 106-398), as amended by section 3115 of the National Defense Authorization Act for FY 2004 (Public Law 108-136), regarding the

continued operation and maintenance of a high state of readiness of the H-Canyon facility at SRS.

Given the expense involved in designing and constructing a new melt and dilute capability, and because an alternative processing technology (conventional processing) is readily available, DOE determined that melt and dilute is an unnecessarily costly duplication of treatment capability for aluminum-clad SNF. Conventional processing and down-blending the HEU to LEU, with vitrification rather than the recovery of plutonium, furthers the Nation's non-proliferation goals.

Although the Secretary of Energy has determined that Yucca Mountain is not a workable option for a geologic repository, DOE remains committed to meeting its obligations to safely dispose of SNF and HLW[6]. While this Amended ROD will increase the number of canisters of vitrified HLW, this is not expected to significantly affect the quantity of vitrified HLW requiring management.

Separately, the receipt of target residue materials from Canada in liquid form under the U.S. Foreign Research Reactor Acceptance Policy does not present significant new health or environmental concerns or impacts as described in the SA. The repatriation of U.S.-origin HEU from Canada will help ensure national and international safety and security by downblending this material to LEU that would be available for beneficial use in power reactors. This action is

[6] The Secretary's *Strategy for the Management and Disposal of Used Nuclear Fuel and High-level Radioactive Waste*, January 2013, endorses the key principles of the 2012 Blue Ribbon Commission on America's Nuclear Future report and represents an initial basis for discussions among the Administration, the Congress, and other stakeholders toward a sustainable path forward for disposition of nuclear waste.

consistent with U.S. agreements regarding receipt of FRR materials in which involved countries with the economic ability to do so contribute to the costs of transportation and U.S. receipt, processing and disposition of the materials.

In summary, the proposed use of conventional processing for a limited quantity of SNF as described in this amendment to DOE's 2000 SNF ROD takes advantage of existing processes in existing facilities. It will allow near-term progress in processing a portion of the inventory analyzed in the SRS SNF EIS currently stored on the site, thus freeing storage space for expected material receipts and avoiding the cost of creating additional space. The activities encompassed by this amended decision will not incur potential health or environmental impacts significantly different from those analyzed in existing NEPA reviews. These activities will strongly contribute to DOE's commitment to the United States' nuclear non-proliferation goals and are consistent with the U.S. and Canadian agreement reached at the Nuclear Security Summit in March 2012 to expand efforts to return U.S.-origin HEU currently stored in Canada to the U.S. Further, the actions resulting from this Amended ROD will contribute to the production of material that can be put to beneficial energy production for public use, thereby dispositioning some HEU out of South Carolina; and will contribute to an overall safe, secure, and cost-effective strategy for ongoing management of SNF and target residue materials at SRS.

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David Huizenga
Senior Advisor for Environmental Management